

Significant Figures: An introduction

What are significant figures?

What are they used for?

What are the rules for using them?



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Practice Problems:
How many significant figures are in each of the following numbers?

| | |
|-----------|------------|
| A) 2 | F) 10 |
| B) 67 | G) 100 |
| C) 0.345 | H) 10.0 |
| D) 2003 | I) 0.005 |
| E) 0.8091 | J) 0.00340 |

There is more than one kind of zero!

This is not right! This number only has one significant figure and therefore should be written as 1000.

Let's look at the problem 10.0 + 0.001.

10.0 + 0.001 = 10.001

10.001 has 5 significant figures, but the 0.001 is only 1 significant figure. The answer should be 10.0.

What is a Significant Figure?

How many digits in a number are known to be reliable?


1. All non-zero digits are significant.

2. Zeros between non-zero digits are significant.

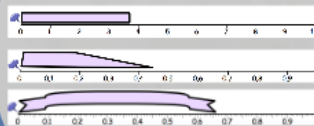
3. Zeros to the right of a decimal point are significant.

4. Zeros to the left of a decimal point are not significant.

What is a Significant Figure?

- How many liters of water are there in the Atlantic Ocean? 
- Encoded message to the reader
- All the digits in a number that you know for sure & one estimated digit
 - Relationship to precision & accuracy
- All the numbers 1 - 9 are always significant
 - Zeros have special rules

*Try recording a few
measurements*



Water in the Atlantic?

According to Wikipedia,

The Atlantic has a volume of

354,700,000 cubic kilometers

That converts to


354,700,000,000,000,000,000 L

of water

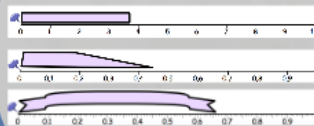
What do you think?

Is that likely to be the EXACT amount of water in
the Atlantic ocean?

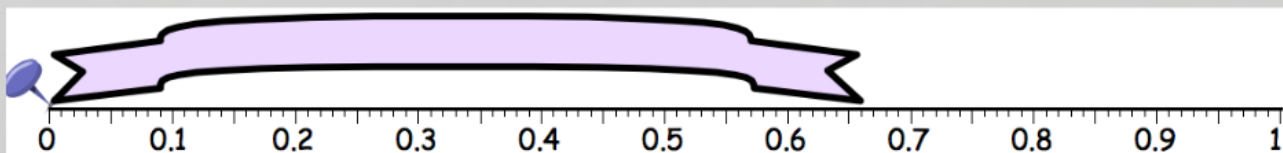
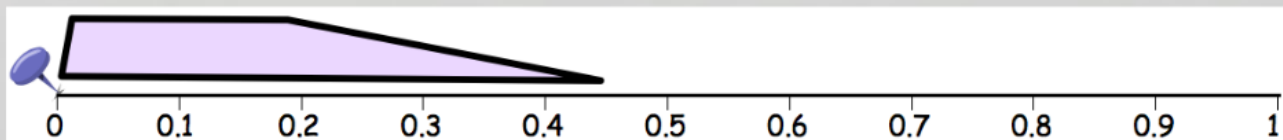
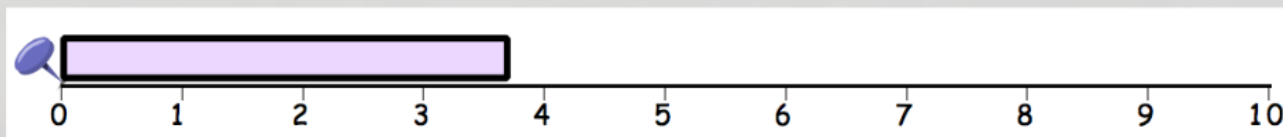
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3

4



0.4

0.5

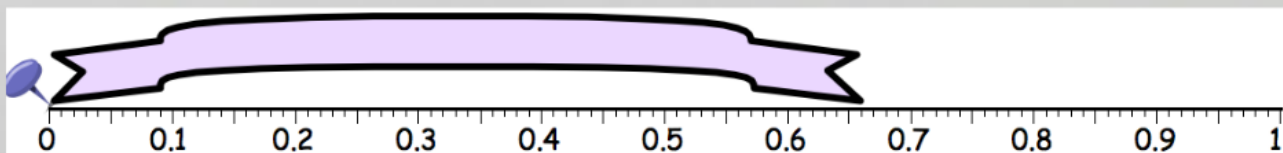
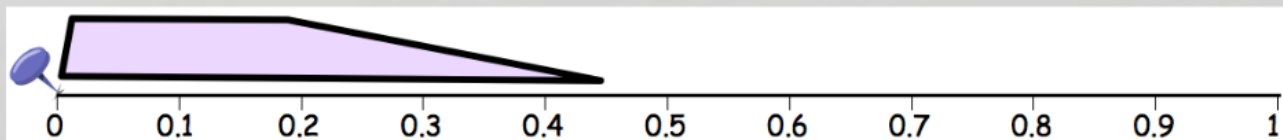
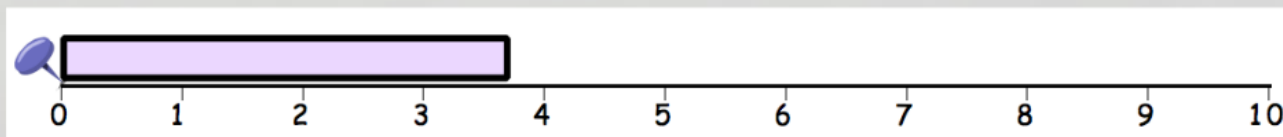


0.5

0.6

0.7

*Try recording a few
measurements*



There is more than one kind of zero?

- This is not math class... numbers come from measurements and therefore include a certain amount of error
- Rules for dealing with zeros...
- Is the zero there for precision? Is it a placeholder?
- Underline & Dot method

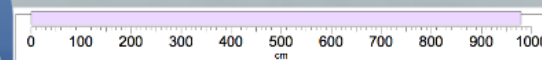
The Underline & Dot Method

When all you see is the number, how do you know where the "estimated digit" is?

Underline & Dot

- Step 1: Underline all the non-zero digits from the leftmost digit to the rightmost non-zero digit. There may be some zeros in there. That is ok. Be sure that all the non-zero digits are underlined though 107500 107.500
- Step 2: IF THERE IS A "DOT" in the number, continue the underline to include all of the TRAILING zeros.
107500 107.500
- All underlined numbers are significant. That means that when the measurement was recorded, all those numbers were known or were the one estimated digit.

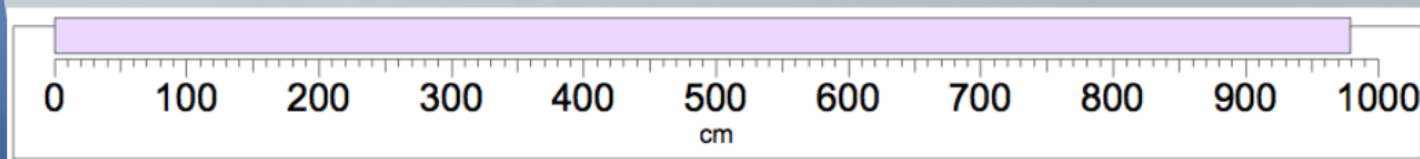
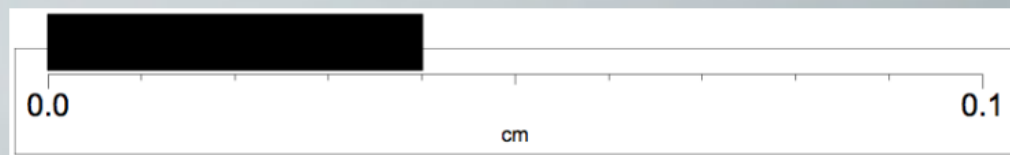
*Is the zero there
for precision?*



1
1.0
1.20

0.04
0.040
0.0540

*Is the zero there
for precision?*



1
1.0
1.20

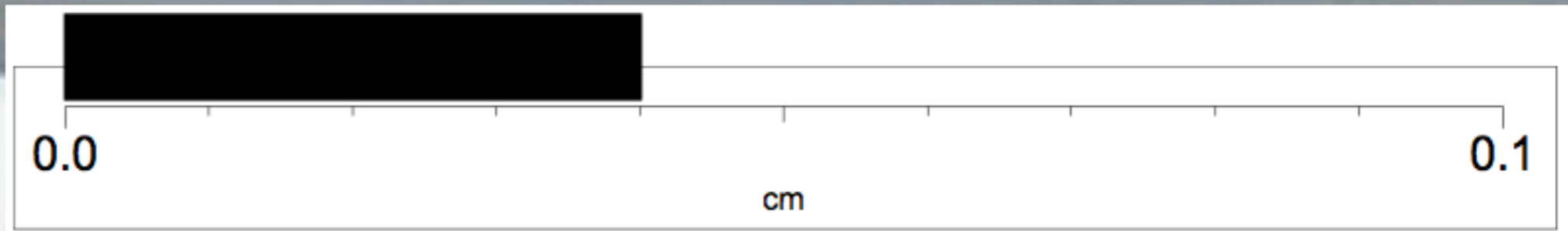
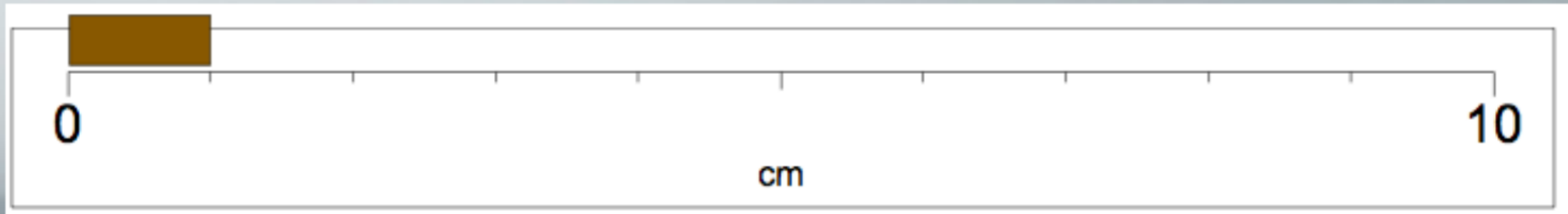
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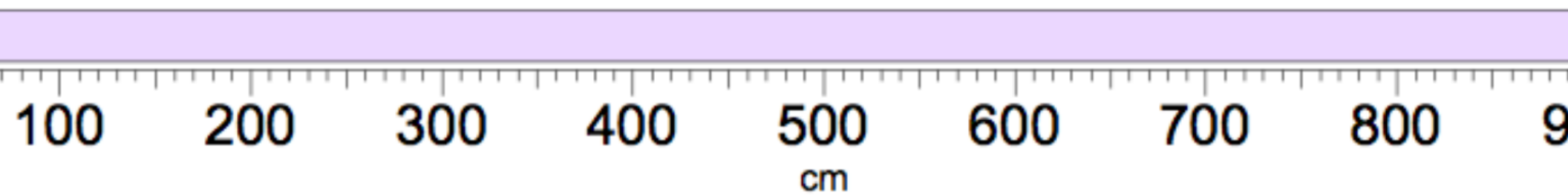
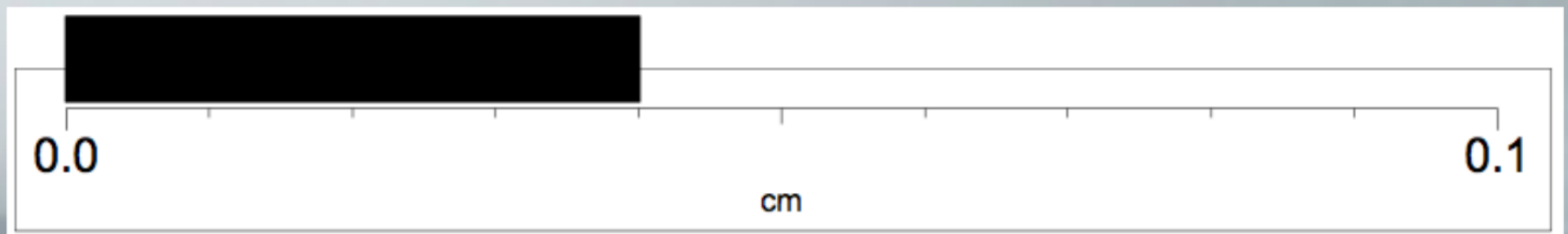
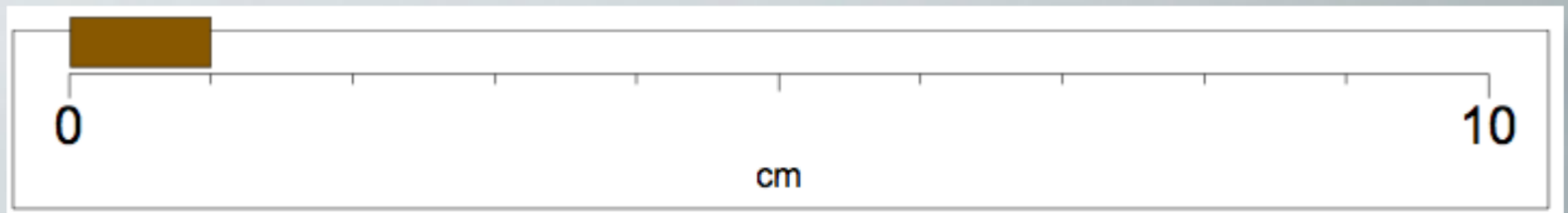
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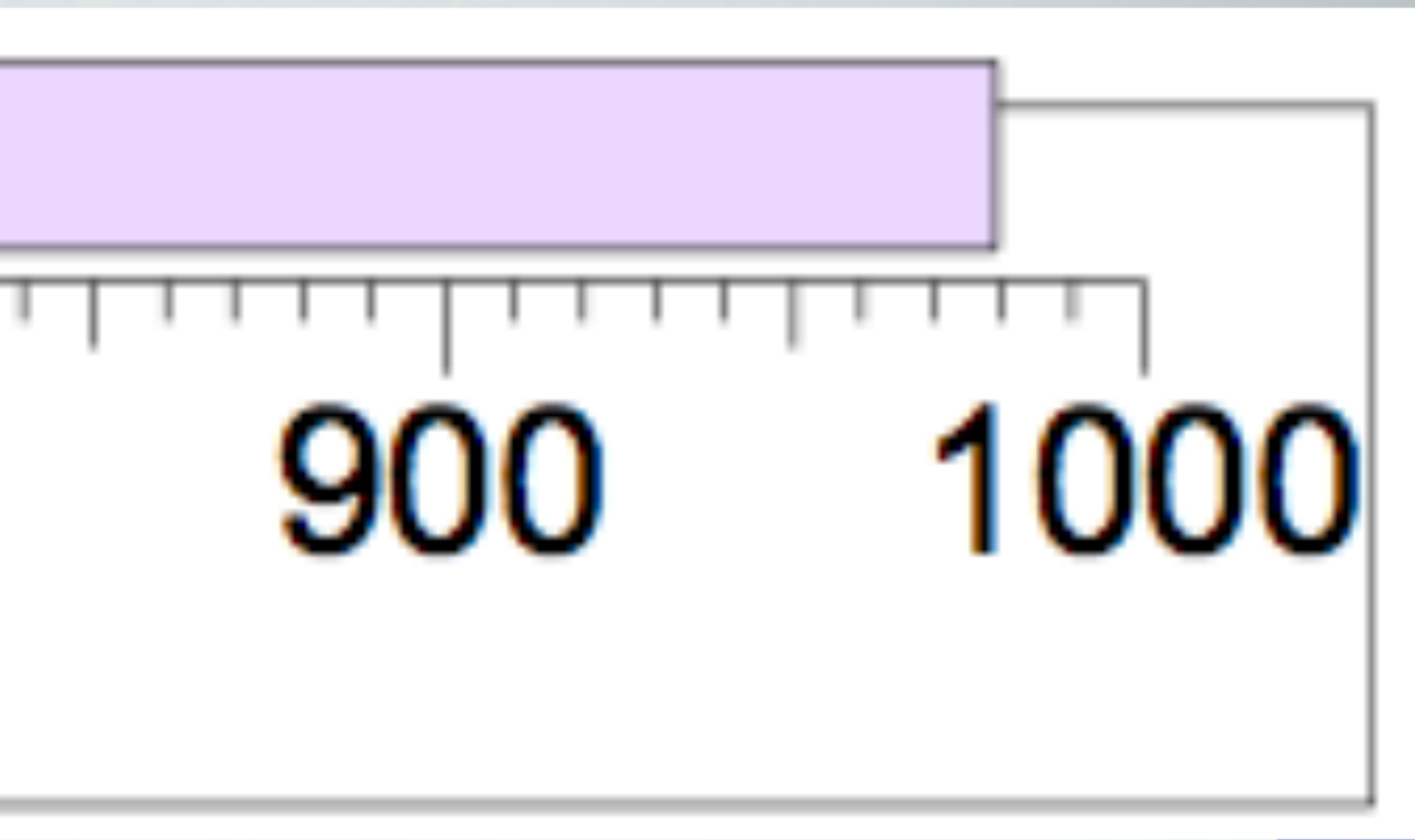


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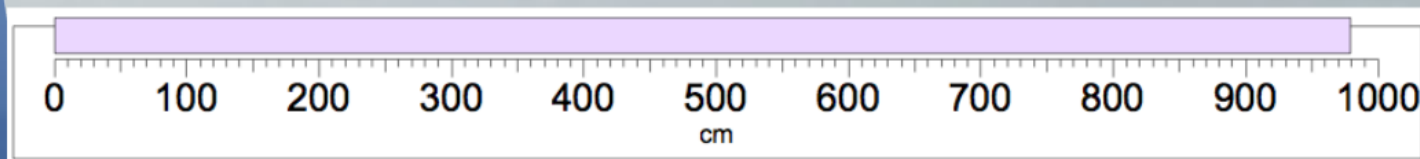
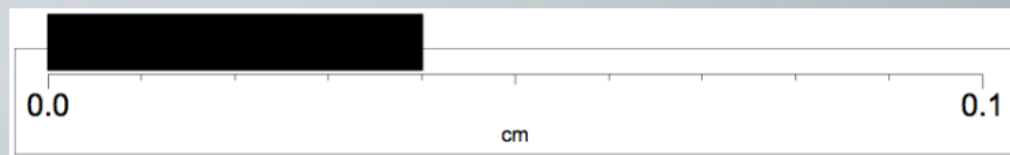


for precision:





*Is the zero there
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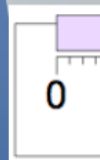
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Practice Problems:

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A) 2

B) 67

C) 0.345

D) 2103

E) 0.8091

F) 10

G) 100

H) 10.0

I) 0.005

J) 0.00340

Answers:

| | Significant Figures |
|------------|---------------------|
| A) 2 | 1 |
| B) 67 | 2 |
| C) 0.345 | 3 |
| D) 2103 | 4 |
| E) 0.8091 | 4 |
| F) 10 | 2 |
| G) 100 | 1 |
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Answers:

| Underline & Dot | Number of Sig Figs |
|--------------------|-----------------------|
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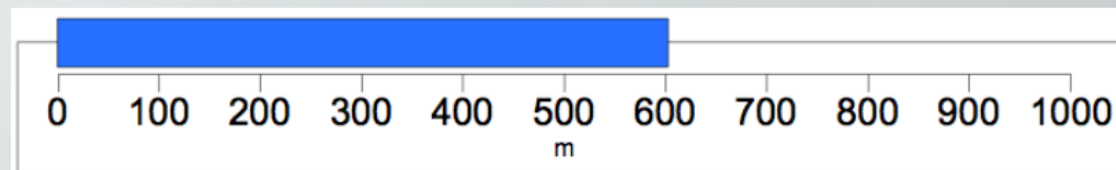
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Something to ponder...

Using Sig Figs is NOT the best way to send a message about the amount of error in a number. So why are we using Sig Figs?

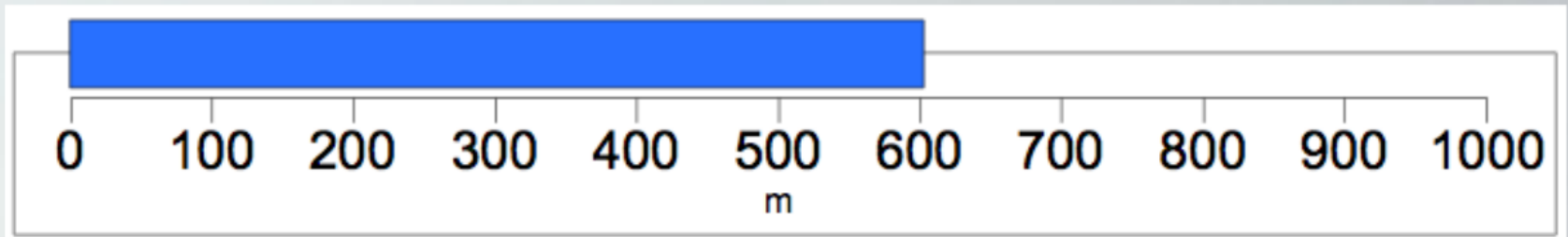
Consider this example:



What problem are you faced with when trying to properly record this number?
How will you solve that problem?

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